

Intravenous & Endocavitary Contrast Enhanced Ultrasound (CEUS) in Multiseptated Pyogenic Liver Abscess Drainage

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2. Key words

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1. Abstract

Pyogenic liver abscess is a potentially life-threatening pathology, while image-guided drainage is highly indicative as first-line treatment approach. We report the case of an 84-year-old woman, diagnosed with large multiseptated pyogenic liver abscess, aiming to stress out the immense contribution of both intravenous and endocavitary administration of Sonovue[™] (Bracco-Milan) in US-guided percutaneous interventional procedures.

3. Abbreviations: CEUS: Contrast-Enhanced Ultrasound; US: Ultrasound; CT: Computerized Tomography; MRI: Magnetic Resonance Imaging; MI: Mechanical Index; IV: Intravenous; PLA: Pyogenic Liver Abscess

4. Introduction

Throughout the last decades, an imaging revolution with the accretive use of Ultrasound Contrast agents (UCAs) and a gradual establishment of Contrast Enhanced Ultrasound (CEUS) as an imaging technique, are being witnessed. Although the value of CEUS in diagnostic practice have been demonstrated by numerous studies, the utilization of UCAs in interventional procedures has been emerging the last few years, either with intravenous or endocavitary administration [1].

On the other hand, pyogenic liver abscess (PLA) is a high mortality associated pathology with a rate ranging from 10-40% [2]. Nowadays, the vast majority of etiologies of PLAs concern pathologic conditions of the biliary tract, when a certain risk factor is present [3]. Combined antibiotic therapy and image-guided percutaneous drainage have become the first-line treatment in most cases, greatly improving patients' prognosis, hence the decrease of the mortality rate to 6.31% [3-5].

In this study, the feasibility of intravenous and intracatheter ad-

ministration of Sonovue[™] as an UCA in management of a complex PLA is demonstrated, aiming to stress out Contrast Enhanced Ultrasound contribution and possibilities in ultrasound guided interventional procedures, as well as the benefits arising from the use of UCAs contrary to B-mode imaging, for daily clinical practice, in complex septic liver fluid collections needing percutaneous intervention.

5. Case Report

An 84-year-old female with no prior relevant medical history presented to the emergency department with symptoms of acute cholangitis and sepsis. Initial laboratory results demonstrated increased white blood cell (WBC) count (~14X10³) and deranged values of hepatic enzymes and C-Reactive Protein (CRP). Imaging investigation with unenhanced abdominal US, revealed a large (~15X13 cm) hypoechoic micro cystic lesion in the right liver lobe, dilated common bile duct and choledocholithiasis, indicative of liver abscess due to ascending cholangitis. Abdominal CT and MRI scans demonstrated a large multiloculated, peripherally enhancing lesion, with low density (on CT)/hyperintense (on DWI) numerous central regions, involving multiple liver segments (IV, V, VI), confirming the diagnosis of a large multiseptated liver abscess (**Figure 1**).

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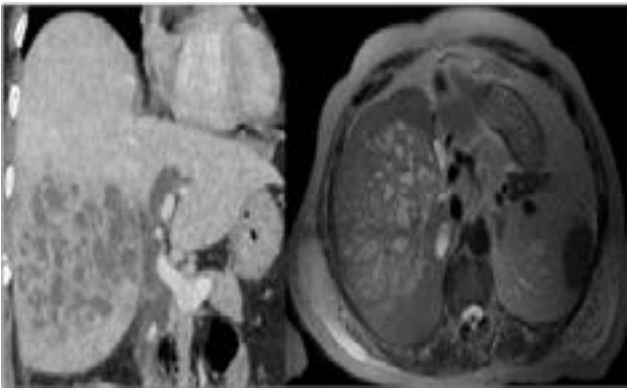


Figure 1: Coronal CT reconstruction (portal phase) and axial T2-HASTE MRI sequence. Complex multilocular liver abscess and cholelithiasis. Note the multiple septa as well as the numerous abscess micro and macro cavities.

Based on literature, image-guided percutaneous drainage was highly recommended, to relieve sepsis before any further surgical treatment [2-4].

The patient was referred to Ultrasound Imaging Department in our hospital for evaluation and percutaneous transhepatic procedure [5]. After obtaining an informed consent by the patient [6], using a Supersonic Imagine Aixplorer[®] Ultimate ultrasound system, a low MI IV CEUS liver scan was performed and under CEUS guidance, an 8 Fr pigtail catheter was placed in liver segment VI using Seldinger technique [7-10]. Due to persisting symptomatology, a diagnostic and interventional follow-up scan in 48 hours was scheduled. Repeat IV CEUS demonstrated a couple of new abscess cavities. The initial drainage catheter was over-the-wire upsized to a 10 Fr counterpart and a couple more of 10 Fr pigtail drainage catheters were placed, using the same technique, into the identified cavities in different liver segments (IV and V respectively). Each percutaneous puncture was followed by endocavitary CEUS, to assess and confirm the accurate site of needle and catheter positioning [11, 12].

Based on EFSUMB guidelines, for IV CEUS, 1 ml Sonovue[™] was administered through a 20 G cannula situated in the left antecubital fossa, followed by a 10 ml flush of normal saline 0,9%, while for endocavitary imaging, a dilution of 0,1 ml Sonovue[™] in 20 ml of saline was injected via needle or through the inserted drainage catheters [13-16].

Successful percutaneous catheter placement and drainage has been beneficial to the patient's condition, followed by an open surgery, treating the underlying cause of the abscess.

6. Results & Discussion

Intravenous CEUS images were directly comparable to CT and MRI scans, while providing the advantage of real-time three-dimensional planning and tracking of the needle-catheter [16]. Surrounding structures and large vessels were acknowledged and avoided (**Figure 2**).

Endocavitary administration of Sonovue[™] through puncture needle, confirmed communication between abscess cavities predisposing adequate drainage, despite the presence of multiple septae. Intracatheter Sonovue[™] administration confirmed the correct placement of drainage catheters in 3 out of 4 attempts (75%) (**Figure 3**).

With regards the single misplaced catheter attempt, after slight retraction, a complementary Sonovue[™] injection demonstrated the accuracy of the positioning (**Figure 4**). No communication between the abscess and surrounding vessels or bile ducts was detected.

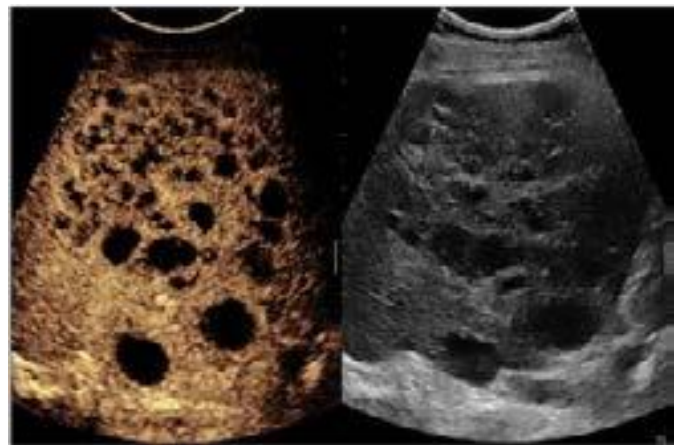


Figure 2: Intravenous CEUS in multiseptated liver abscess. CEUS & B-mode side-by-side imaging. IV CEUS is advantageous over B-mode imaging, delineating the cystic parts, as well as the margins of the complex abscess.



Figure 3: Endocavitary CEUS. Intracatheter Sonovue[®] injection demonstrating proper drainage catheter placement and intracavitary communication between multiple abscess cavities.

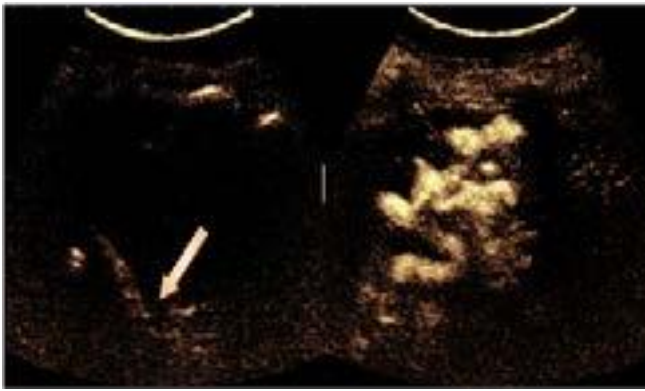


Figure 4: Endocavitary CEUS; injection via the misplaced catheter. Note the microbubble jet over the liver capsule to the peritoneal cavity (arrow). Following a slight retraction, intracatheter Sonovue[®] injection demonstrates correct catheter sitting.

On the contrary to other contrast-enhanced modalities, CEUS is a cost-effective, radiation-free and real-time examination and may be performed bedside, proving portability as an important characteristic for image-guided interventional procedures. Moreover, modern second generation UCAs (such as Sonovue[™]) have a non nephrotoxic profile and their administration is rarely complicated with allergic or severe adverse reactions [1, 11, 14, 16].

CEUS is a well proven imaging modality that improves the detection and characterization of a liver abscess, with the presence of rim enhancement (in arterial phase), septa enhancement (honeycomb appearance), no enhancement in the cystic areas and venous hypoenhancement being the most common imaging features of this certain pathology [10]. While hepatic abscesses require the careful assessment of several aspects (number of lesions, size, content, extent of the abscess and presence of fistulas) CEUS improves imaging quality, thus being very useful for interventional procedure planning and process [9-11].

7. Conclusion

Pre-interventional intravenous CEUS is a useful tool, providing substantial details in PLA imaging. Abscess cavities, as long as the surrounding structures can be distinctly depicted, in order to plan the ideal track towards the target sites [12, 14, 16, 17].

In concordance with current literature, endocavitary injection of Sonovue[®] in PLA has been an invaluable process in our case, delineating the abscess cavities, confirming inter septal communication and allowing the identification of correct positioning of drainage catheters [15, 16, 18-21].

The utilization of both intravenous and endocavitary CEUS could further assist interventional radiologists in management of complex liver abscesses, increasing the success rate in drainage, whilst lessening the complication rates and the patient-doctor radiation induced.

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